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[Title Of The Invention]

PACKAGE FOR ENCAPSULATION OF SEMICONDUCTOR ELEMENT

[Abstract]

PURPOSE: To provide a package for encapsulation of a semiconductor element which can attach an external lead terminal extremely firmly to an insulating substrate through a metallized pad by solidifying the strength of adhesion between the metallized pad and the insulating substrate.

CONSTITUTION: This is a package for encapsulation of a semiconductor element, where a metallized pad 4a to which each electrode of a semiconductor element is connected electrically is attached to the outside of an insulating container for encapsulating a semiconductor element and an outer lead terminal 6 is soldered to the metallized pad 4a, and a plurality of holes 4b, 1500 to 25000 $\mu\text{m}^2$  in area are formed in the metallized pad 4a so that the whole area of openings may be 0.5 to 35% to the whole area of the metallized pad 4a.

[Claim(s)]

[Claim 1]It is a package for semiconductor device storage which carries out low attachment of the external lead terminal at this metallized pad while making a metallized pad by which each electrode of a semiconductor device is electrically connected to an outside surface of an insulating vessel in which a semiconductor device is accommodated laminate, A package for semiconductor device storage forming so that puncturing area may receive said metallized pad, two or more full admission punched surface products may receive the total surface area of a metallized pad in a hole of 1500 thru/or 25000  $\mu\text{m}^2$  and it may become 0.5 thru/or 35.0%.

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to improvement of the package for semiconductor device storage for accommodating a semiconductor device.

[0002]

[Description of the Prior Art]The package for semiconductor device storage for accommodating semiconductor devices, such as LSI (large scale integration circuit element), conventionally usually, The tungsten which was missing from the bottom and was drawn from the crevice and this circumference of a crevice for comprising the nature sintered compact of an aluminum oxide, and accommodating a semiconductor device in the upper surface approximately center part, The insulating base which has a metallized wire layer which comprises high-melting point metal powder, such as molybdenum and manganese, It comprises the external lead terminal and lid which were attached in the metallized pad located in the termination of said metallized wire layer in order to electrically connect a semiconductor device to an external electric circuit via filter media, such as silver solder, While carrying out attachment and fixing of the semiconductor device to the recessed bottom face of an insulating base, each electrode of this

semiconductor device is connected to a metallized wire layer via a bonding wire, After an appropriate time, the insulating base upper surface is made to attach a lid, and it becomes a semiconductor device as a final product by closing a semiconductor device airtightly inside the container which comprises an insulating base and a lid.

[0003]As for this conventional package for semiconductor device storage, generally, the insulating base is manufactured by the following methods.

[0004]Namely, (1) alumina ( $\text{Al}_2\text{O}_3$ ) and silica ( $\text{SiO}_2$ ), The organic solvent of calcia ( $\text{CaO}$ ), magnesia ( $\text{MgO}$ ), etc. suitable in the end of precursor powder, They are a sheet shaped, nothing, and a ceramic green sheet (ceramic raw sheet) of two or more sheets by adopting this slurry thing for a well-known doctor blade method, the calender roll method, etc. conventionally, while carrying out addition mixing of the solvent and making with the shape of slurry. It obtains.

[0005](2) While forming a through hole in said each ceramic green sheet next, carry out print coating of the metal paste which changes from high-melting point metal powder, such as tungsten, molybdenum, and manganese, to the inside of this through hole, and the upper and lower sides with screen printing, and make the conductor for wiring of a prescribed pattern laminate.

[0006](3) And while it pressurizes while laminating said each ceramic green sheet up and down finally, and obtaining a raw layered product, The organic solvent which calcinates this raw layered product at the temperature of about 1600 degrees C, and is contained in each ceramic green sheet and metal paste, It becomes an insulating base which has the metallized wire layer and metallized pad as a product by carrying out the sintering unification of each ceramic green sheet and the conductor for wiring, making the evaporation discharge of the solvent carry out outside.

[0007]

[Problem(s) to be Solved by the Invention]However, in this conventional package for semiconductor device storage. When obtaining the insulating base which carries out the sintering unification of the ceramic green sheet of two or more sheets on which the conductor for wiring was laminated since the conductor for wiring by which print coating was carried out to the ceramic green sheet had covered a part of upper and lower sides of the ceramic green sheet, and has a metallized wire layer and a metallized pad, The organic solvent which comes out of each ceramic green sheet, and the thing which the solvent evaporated The conductor for wiring, Being emitted outside by the conductor for wiring used as the metallized pad located especially in the outermost part is prevented, As a result, what the organic solvent and the solvent evaporated collected between the metallized pad and the insulating base, the void (hole) was formed, and it had the fault that the covering intensity to the insulating base of a metallized pad became weak. Therefore, after carrying out low attachment of the external lead terminal with this package for semiconductor device storage at a metallized pad, When external force was impressed to the external lead terminal, this external lead terminal exfoliated with the metallized pad more easily than an insulating base, and had invited the fault that the function as a package for semiconductor device storage lost.

[0008]

[Objects of the Invention]This invention was thought out in view of the above-mentioned fault, the purpose strengthens covering intensity of a metallized pad and an insulating base, and it is in providing the package for semiconductor device storage which can attach an

external lead terminal in an insulating base very firmly via a metallized pad.

[0009]

[Means for Solving the Problem] This invention is a package for semiconductor device storage which carries out low attachment of the external lead terminal at this metallized pad while making a metallized pad by which each electrode of a semiconductor device is electrically connected to an outside surface of an insulating vessel in which a semiconductor device is accommodated laminate, It formed so that puncturing area might receive said metallized pad, two or more full admission punched surface products might receive the total surface area of a metallized pad in a hole of 1500 thru/or 25000  $\mu\text{m}^2$  and it might become 0.5 thru/or 35.0%.

[0010]

[Example] Next, this invention is explained in detail based on an accompanying drawing. Drawing 1 And drawing 2 One example of the package for semiconductor device storage of this invention is shown, and an insulating base and 2 are lids one among a figure. The insulating vessel A which accommodates the semiconductor device 3 comprises this insulating base 1 and lid 2.

[0011] Said insulating base 1 The nature sintered compact of an aluminum oxide, the nature sintered compact of mullite, Electrical insulation materials, such as a nature sintered compact of aluminum nitride and a nature sintered compact of silicon carbide, are comprised, the crevice 1a which forms the blank for accommodating the semiconductor device 3 in the upper surface approximately center part is formed, and adhesion fixing of the semiconductor device 3 is carried out to this crevice 1a bottom via the adhesives which comprise a filter medium, glass, resin, etc.

[0012] Said insulating base 1 For example, when nature sintering tungsten of an aluminum oxide is comprised, Alumina ( $\text{Al}_2\text{O}_3$ ) and silica ( $\text{SiO}_2$ ), An organic solvent suitable in the end of precursor powder, such as calcia ( $\text{CaO}$ ) and magnesia ( $\text{MgO}$ ), While carrying out addition mixing of the solvent and making with the shape of slurry, a well-known doctor blade method, the can lender rolling method, etc. are adopted conventionally, and this is fabricated to a sheet shaped, and it is a ceramic green sheet (ceramic raw sheet). It obtains, While performing suitable punching processing for said ceramic green sheet after an appropriate time, two or more sheets are laminated, and it is an elevated temperature (about 1600 degrees C). It is manufactured by calcinating.

[0013] Apply to the bottom from the crevice 1a circumference at said insulating base 1, and covering formation of two or more metallized wire layers 4 is carried out, Each electrode of the semiconductor device 3 is electrically connected to the crevice 1a periphery of this metallized wire layer 4 via the bonding wire 5, The part exposed to the bottom of the insulating base 1 constitutes the metallized pad 4a, and low attachment of the external lead terminal 6 is carried out via filter media, such as silver solder, at this metallized pad 4a.

[0014] The metallized wire layer 4 and the metallized pad 4a which were provided in said insulating base 1 Tungsten, Comprising high-melting point metal powder, such as molybdenum and manganese, this metallized wire layer 4 and the metallized pad 4a succeed in the operation which makes the external lead terminal 6 connected to an external electric circuit flow through each electrode of the semiconductor device 3 electrically.

[0015] Said metallized wire layer 4 and the metallized pad 4a For example, the suitable organic solvent for high-melting point metal powder, such as tungsten, Covering formation is carried out to the prescribed position of the insulating base 1 by carrying out print

coating of the metal paste which obtained the solvent by carrying out addition mixing to the ceramic green sheet used as the insulating base 1 with well-known screen printing conventionally beforehand at the prescribed pattern.

[0016]In the metallized pad 4a by which covering formation is carried out to the bottom of said insulating base 1, it is drawing 2. Two or more puncturing area is formed for the hole 4b of 1500 thru/or 25000  $\mu\text{m}^2$  so that a full admission punched surface product may be 0.5 thru/or 35.0% to the total surface area of the metallized pad 4a, so that it may be shown. Therefore, two or more ceramic green sheets by which print coating was carried out in metal paste are laminated, The organic solvent which comes out of each ceramic green sheet when calcinating this and accomplishing with the insulating base 1, From the part equivalent to the hole 4b of the metallized pad 4a, what the solvent evaporated is emitted outside, does not collect between the metallized pad 4a and the insulating base 1, and, as a result, can make the covering intensity of the metallized pad 4a and the insulating base 1 with a very firm thing.

[0017]The puncturing area said metallized pad 4a by less than 1500microm<sup>2</sup>. And when calcinating a ceramic green sheet as the sum total of the puncturing area of each metallized pad 4a is less than 0.5 % of the total surface area of the metallized pad 4a, and obtaining the insulating base 1, It becomes insufficient emitting to the exterior of the organic solvent and solvent which are contained in a ceramic green sheet, and the covering intensity of the metallized pad 4a and the insulating base 1 falls, If puncturing area exceeds 25000  $\mu\text{m}^2$  and the sum total of the puncturing area of each metallized pad 4a exceeds 35.0% of the total surface area of the metallized pad 4a, when low attachment of the external lead terminal 6 will be carried out at the metallized pad 4a, The bonding strength of a filter medium and the metallized pad 4a becomes weak, and it becomes impossible to carry out low attachment of the external lead terminal 6 firmly at the metallized pad 4a. Therefore, the puncturing area is the range of 1500 thru/or 35000  $\mu\text{m}^2$ , and, as for said metallized pad 4a, the sum total of the puncturing area of each metallized pad 4a is specified as 0.5 thru/or 35.0% of range to the total surface area of the metallized pad 4a.

[0018]Said metallized pad 4a is excellent in the corrosion resistance of nickel, gold, etc. on the surface, And if wettability makes 1.0 thru/or a thickness of 20.0 micrometers carry out layer arrival of the good metal to a filter medium with plating, while being able to prevent the oxidization corrosion of the metallized pad 4a effectively, low attachment by the metallized pad 4a and the external lead terminal 6 can be made as it is very firm.

Therefore, it is preferred for said metallized pad 4a to prevent oxidization corrosion, and to make the surface carry out layer arrival of nickel, the gold, etc. to 1.0 thru/or a thickness of 20.0 micrometers, for strengthening low attachment of the external lead terminal 6.

[0019]On the other hand, the external lead terminal 6 by which low attachment is carried out changes from metallic materials, such as covar metal and 42 alloys, to the metallized pad 4a of said insulating base 1, and it succeeds in the operation which electrically connects each electrode of the semiconductor device 3 to an external electric circuit.

[0020]Said external lead terminal 6 is formed in predetermined rod form in ingots (lump), such as covar, by adopting a well-known metal processing method conventionally [, such as a strip-processing method and the punching processing method, ].

[0021]Low attachment to the metallized pad 4a of said external lead terminal 6, The metallized pad 4a of the insulating base 1 bottom is made to lay the end of the external lead terminal 6 on both sides of filter media, such as silver solder, in between, It is carried

out by carrying out heat melting of said filter medium at the temperature about 850 degrees C after an appropriate time, In this case, since the bottom of the insulating base 1 is covered firmly, low attachment attachment of the metallized pad 4a will be carried out on the bottom of the insulating base 1 very firmly [ the external lead terminal 6 by which low attachment is carried out at this metallized pad 4a ].

[0022]According to the package for semiconductor device storage of this invention, the semiconductor device 3 on the crevice 1a bottom of the insulating base 1 in this way Glass, While carrying out attachment and fixing via adhesives, such as resin and a filter medium, each electrode of the semiconductor device 3 is electrically connected to the metallized wire layer 4 via the bonding wire 5, After an appropriate time, the lid 2 is joined to the upper surface of the insulating base 1 via sealant from glass, resin, etc., and it becomes a semiconductor device as a final product by accommodating the semiconductor device 3 in the inside of insulating vessel A which comprises the insulating base 1 and the lid 2 airtightly.

[0023]Various change is possible if this invention is a range which is not limited to an above-mentioned example and does not deviate from the gist of this invention.

[0024]

[Effect of the Invention]According to the package for semiconductor device storage of this invention, puncturing area the hole of 1500 thru/or 25000  $\mu\text{m}^2$  to the metallized pad made to laminate on the outside surface of an insulating vessel in which a semiconductor device is accommodated two or more, The metal paste which serves as a metallized pad and a metallized wire layer since it formed so that a full admission punched surface product might be 0.5 thru/or 35.0% to the total surface area of a metallized pad laminates two or more ceramic green sheets by which print coating was carried out, The organic solvent which comes out of each ceramic green sheet when calcinating this and accomplishing with an insulating base, It becomes possible to emit outside what the solvent evaporated good, not to collect between a metallized pad and an insulating base from the part equivalent to the hole of a metallized pad, and to, make the covering intensity of a metallized pad and an insulating base with a very firm thing as a result.

[0025]Therefore, with the package for semiconductor device storage of this invention, an external lead terminal can be attached in an insulating base very firmly via a metallized pad, The electrical link of the semiconductor device accommodated in the inside of the container which comprises an insulating base and a lid can be carried out to an external electric circuit certainly and correctly through an external lead terminal.

[Brief Description of the Drawings]

[Drawing 1]It is a sectional view showing one example of the package for semiconductor device storage of this invention.

[Drawing 2]It is an important section expanded sectional view of the package for semiconductor device storage shown in drawing 1.

[Description of Notations]

1 .... Insulating base

1a ... Crevice

2 .... Lid

3 .... Semiconductor device

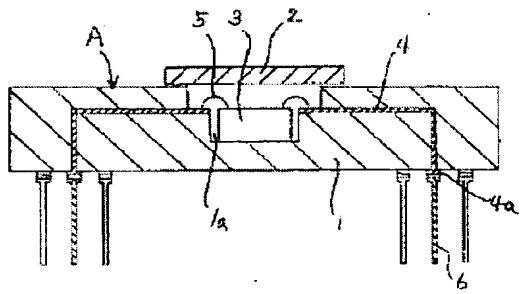
4 .... Metallized wire layer

4a ... Metallized pad

4b ... Hole formed in the metallized pad

6 .... External lead terminal

【図 1】



【図 2】

